What is claimed is:

1. In a scanning probe microscope which observes microscopic structures on a sample surface by, at the same time as performing raster scanning along a first scanning axis substantially parallel to the sample surface and a second scanning axis substantially parallel to the sample surface and orthogonal to the first scanning axis of a sample surface using a microscopic probe, causing the probe to move relatively in the direction of a third scanning axis orthogonal to both the first scanning axis and the second scanning axis so as to follow undulations on the sample surface, the improvement comprising: scanning control means for controlling relative raster scanning of the probe with respect to the sample, and displacement detection means for measuring relative position and displacement of the probe in the direction of the second scanning axis or the third scanning axis relative to the sample.

2. The scanning probe microscope of claim 1, wherein the displacement detection means simultaneously detects relative position or displacement of the probe with respect to the sample in the direction of the first scanning axis, second scanning axis and third scanning axis, and saves results in a storage device, and an observation image is generated based on the relative position or displacement of the sample with respect to the sample for each of the scanning axes saved in the storage device.

3. The scanning probe microscope of claim 2, wherein the scanning control means performs feedback control in the direction of at least one axis, of the first scanning axis and the second scanning axis of the raster scanning, based on relative position or displacement of the probe with respect to the sample detected by the displacement detection means.

4. The scanning probe microscope of claim 3, wherein the scanning control means performs feedback control so that relative position or displacement of the probe with respect to the sample in the direction of a scanning axis having a low scanning frequency, of the first scanning axis and the second scanning axis, becomes constant during one period of scanning in the direction of a scanning axis, of the first scanning axis and the second scanning axis, having a high scanning frequency.

5. The scanning probe microscope of claim 3, wherein the scanning control means performs feedback control so that relative position and displacement of the probe with respect to the sample in the direction of a scanning axis having a low scanning frequency, of the first scanning axis and the second scanning axis, becomes constant during one half

period of scanning in the direction of a scanning axis, of the first scanning axis and the second scanning axis, having a high scanning frequency.

6. The scanning probe microscope of claim 2, wherein the scanning control means performs raster scanning control so that a scanning range in a direction of at least one scanning axis, of the first scanning axis and the second scanning axis of the raster scanning, includes a range being observed and a larger range.

7. The scanning probe microscope of claim 6, wherein the scanning control means performs raster scanning control so that a scanning range in a direction of a scanning axis having a high scanning frequency, of the first scanning axis and the second scanning axis of the raster scanning, includes a range being observed and a larger range.

8. The scanning probe microscope of claim 7, wherein the displacement detecting means commences sampling, and storage into a storage device, of relative position and displacement of the probe relative to the sample in a direction of the first scanning axis, second scanning axis and third scanning axis at an arbitrary sampling period, at the same time as the relative position and displacement of the probe with respect the sample in a direction of a scanning axis having a high scanning frequency, of the first scanning axis and the scanning axis of the raster scanning, enter a range being observed.

9. The scanning probe microscope of claim 7, wherein the displacement detecting means commences sampling, and storage into a storage device, of relative position or displacement of the probe relative to the sample in a direction of the first scanning axis, second scanning axis and third scanning axis at an arbitrary sampling period, at a point in time where the rate of change over time of relative position or displacement of the probe with respect to the sample in a direction of a scanning axis having a scanning high frequency, of the first scanning axis and the scanning axis of the raster scanning, become constant or become a predetermined value.

10. The scanning probe microscope of claim 7, wherein the displacement detecting means commences sampling, and storage into a storage device, of relative position or displacement of the probe relative to the sample in a direction of the first scanning axis, second scanning axis and third scanning axis at an arbitrary scanning period, at a point in time when two conditions, namely the relative position or displacement of the probe with respect to the sample in a direction of a scanning axis having a high scanning frequency, of the first scanning axis and the scanning axis of the raster scanning, entering a range being observed, and the rate of change over time of relative position or displacement of the

probe with respect the sample in a direction of a scanning axis having a high scanning frequency, of the first scanning axis and the scanning axis of the raster scanning, becoming constant or becoming a predetermined value, are satisfied.

11. The scanning probe microscope of claim 8, wherein the scanning control means performs feedback control so that rate of change over time of relative position and displacement of the probe with respect to the sample in the direction of a scanning axis having a high scanning frequency, of the first scanning axis and the second scanning axis of the raster scanning, become a set value, until the relative position and displacement of the probe with respect the sample in the direction of the scanning axis having a high scanning frequency enter a range being observed.

12. The scanning probe microscope of claim 8, wherein the scanning control means controls an amount of displacement in a direction of a scanning axis having a high scanning frequency to be larger than a region to be observed so that rate of change over time of relative position and displacement of the probe with respect to the sample in the direction of a scanning axis having a high scanning frequency, of the first scanning axis and the second scanning axis of the raster scanning, become constant, until the relative position and displacement of the probe with respect to the sample in the direction of the scanning axis having a high scanning frequency enter a range being observed.

13. The scanning probe microscope of claim 1, wherein the scanning control means comprises scanning speed adjustment means and sampling pulse generating means.

14. The scanning probe microscope of claim 13, wherein the scanning speed adjustment means adjusts the relative speed of the probe with respect to the sample in the direction of a scanning axis having a high scanning frequency, of the first scanning axis and the second scanning axis of the raster scanning, so that a control error in the direction of the third scanning axis is minimized.

15. The scanning probe microscope of claim 13, wherein the scanning speed adjustment means keeps the relative position or displacement of the probe with respect to the sample in the direction of a scanning axis having a low scanning frequency, of the first scanning axis and the second scanning axis of the raster scanning, constant.

16. The scanning probe microscope of claim 13, wherein the scanning speed adjustment means adjusts the relative speed of the probe with respect to the sample in the direction of a scanning axis having a high scanning frequency, of the first scanning axis and the second scanning axis of the raster scanning, so that an absolute value of a control error in the

direction of the third scanning axis is minimized.

17. The probe scanning microscope of claim 16, wherein the sampling pulse generating means generates sampling pulse every time the relative position or displacement of the probe with respect to the sample in the direction of a scanning axis having a high frequency, of the first scanning axis and the second scanning axis of the raster scanning, become a predetermined value.